

# Computational Terminology in eHealth

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# Outline

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- Introduction
- Problems definition
- Digital resource
- Conclusions



# Terminology

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- “Terminology is the study and the field of activity concerned with the collection, description, processing and presentation of terms”\*
- ISO, International Standard 1087  
Terminology - Vocabulary, 5.1
- Terms (not words!): Alzheimer’s disease, DNA

\*Sager, Juan C. Practical course in terminology processing. John Benjamins Publishing, 1990.

# Computational Terminology (CT)

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- Automatic Terms Extraction (ATE)
  - Notion of “Termhood” (degree of relatedness)\*
- Terminological Resources

\*Kageura, Kyo, and Bin Umino. "Methods of automatic term recognition: A review." *Terminology. International Journal of Theoretical and Applied Issues in Specialized Communication* 3.2 (1996): 259-289.



# Computational Terminology in eHealth

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- **Communication**
  - Patient-Doctor Dialogue
- **Specialised Translation**
  - Translation of Medical Information
- **Information Retrieval**
  - Medical Systematic Reviews
- **Semantic change**
  - Study of Diachronic Terminology

# Communication



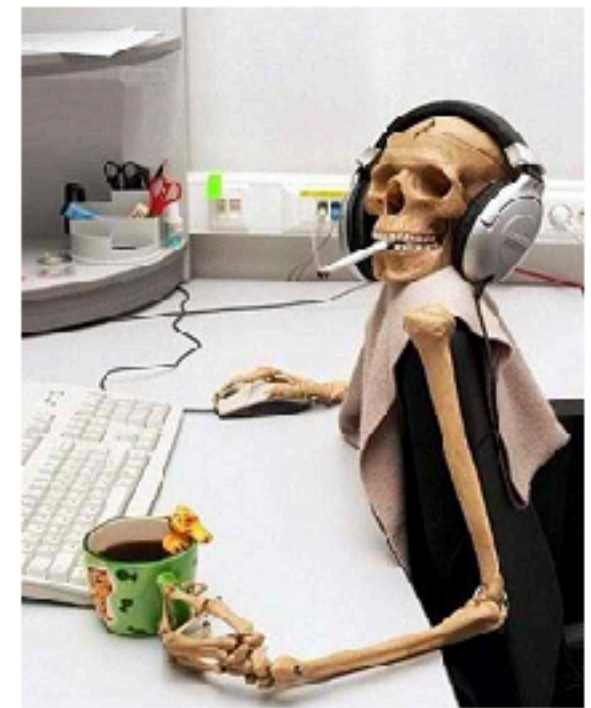
Xanthocyanopsy  
Craniocleidodysostosis  
Agammaglobulinemia



# Specialised Translation

Translators - 10 year challenge.

- Source language
  - Decoding
- Target language
  - Transcoding



# Information Retrieval

- Medical Systematic Reviews
  - Relevant medical documents
  - Query rewriting



# Semantic change

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- Generalisation/Specialisation
- Amelioration/Pejoration
- Metaphor
- Metonymy



**So, even men are hysterical!**



# Terminological Resources

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- Consumer Health Vocabulary
- **InterActive Terminology for Europe (IATE)**
- **Medical Subject Headings (MeSH)**
- Etymological Dictionaries

# Our Proposal

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- TriMED: Digital Library
- New Model of Terminological Record
- Multilingual: English, Italian, French
- Medical domain in general


Vezzani, F., Di Nunzio, G. M., & Henrot, G. (2018). TriMED: a multilingual terminological database. In *Proceedings of the Eleventh International Conference on Language Resources and Evaluation (LREC-2018)*.

# TriMED: Communication


Patient

Technical Term


Pyrexia



DEFINITION  
**Pyrexia is defined as having a temperature above the normal range due to an increase in the body's temperature set-point.**



INFORMATIVE  
**Fever**



POPULAR  
**Temperature**



# TriMED: Specialised Translation

TriMED

☰

Caractéristiques formelles

Sémantique

Corpus

Concordancier

Télécharger

<div>Projet</div> <div>Groupe A</div>	<div>Chargement des données</div> <div>Termes chargés</div>
<div>Terme</div> <div>Oreillons</div>	<div>Termine</div> <div>Parotite</div>
<div>Genre</div> <div>N.m.</div>	<div>Genere</div> <div>S.f.</div>
<div>Accent tonique</div> <div>[ɔʁɛjɔ̃] / [ɔʁɛjɔ̃]</div>	<div>Accento tonico</div> <div>[paʁo'tite]</div>
<div>Orthographe</div> <div>Écrit avec "s" à la fin.</div>	<div>Ortografia</div> <div></div>

# TriMED: Information Retrieval

TriMED

☰

Caractéristiques formelles

Sémantique

Corpus

Concordancier

Télécharger

<div>Projet</div> <div>Groupe A</div>	<div>Chargement des données</div> <div>Termes chargés</div>
<div>Terme</div> <div>Oreillons</div>	<div>Termine</div> <div>Parotite</div>
<div>Définition</div> <div>Maladie infectieuse virale aiguë, extrêmement contagieuse, due à un paramyxovirus et se manifestant principalement par une parotidite bilatérale (inflammation des deux glandes</div>	<div>Definizione</div> <div>Malattia infettiva acuta, contagiosa, causata da un virus a RNA appartenente al gruppo dei Paramixovirus, e caratterizzata da tumefazioni delle parotidi ed</div>
<div>Analyse sémique</div> <div>/maladie/ /infectieuse/ /virale/ /aiguë/ /contagieuse/ /cause/ /paramyxovirus/ /manifestation//parotidite bilatérale/ /inflammation/ /deux glandes parotides/</div>	<div>Analisi Semica</div> <div>/malattia/ /infettiva/ /acuta/ /contagiosa/ /causa/ /virus a RNA/ /Paramixovirus/ /tumefazioni/ /parotidi/ /ghiandole salivari/</div>
<div>Phraseologie (collocation - colligation)</div> <div>Attraper les oreillons, Avoir les oreillons (V + SN); Souffrir des oreillons (V + SP); Virus des oreillons (N + SP), Virus ourlien (N + adj.); Vaccin anti-ourlien (N + adj), Vaccin contre les</div>	<div>Fraseologia (collocazione-colligazione)</div> <div>Parotide epidemica (N + agg.)</div>
<div>Variante sémantique (synonymes, hyponymes et hyperonymes)</div> <div>Synonymes: Fièvre ourlienne, Parotidite infectieuse; Hyperonyme: Maladie infectieuse</div>	<div>Variante semantica (sinonimi, iperonimi, iponimi)</div> <div>Sinonimi: Orecchioni, Gattoni; Iperonimo: Malattia infettiva</div>

# Semantic change

TriMED

≡

Formal features

Semantics

Diachronic variation

Diastratic variation

Diachronic variation

Term

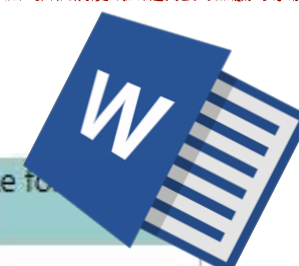
St. Vitus' dance

Current use

Chorea, Sydenham's chorea

# TriMED Structure

# Before TriMED - Word files



LE TERME: <b>le terme</b> (18pt gras)	Le domaine	Le registre	Les sources	IL TRADUCENTE : <b>xxxxxx</b>	Il dominio	Il registro d'uso	Le fo
<b>Caractéristiques formelles:</b> - le genre: - l'orthographe: - la prononciation [API] - autres:				<b>Caratteristiche formali</b> - il genere: - l'ortografia: - l'accento tonico: - altro:			
<b>Définition en langue</b>			sources	<b>Definizione in lingua</b>			Fonti
<b>sémème 1:</b> acception pertinente au contexte <u>analyse</u> en /sèmes/				semema 1: acception pertinente au contexte analisi in /semi/			
sémème 2 : les autres acceptions du même lexème (= concordant italien)				semema 2: della parola italiana (= traduce			
sémème 3 : idem				semema 3: idem			
sémème 4 : idem				semema 4: idem			
etc. ajouter des lignes si nécessaire				ecc.			
<b>Contextes</b> tirés du texte à traduire ( <b>terme observé</b> )			référence: année: page:	<b>Proposte di traduzione</b> ( <b>traducente</b> )			
1. 2. 3. 4. 5. 6. 7.							
<b>Contextes tirés du corpus spécialisé</b>			sources	<b>Contesti tratti da corpus specializzato italiano</b>			fonti
<b>Collocations - phraséologie</b>				<b>Collocazioni - fraseologia italiana (da documenti italiani)</b>			
<b>Bibliographie</b> - - - - -			N° de référence à utiliser dans les colonnes ci-dessus	<b>Bibliografia</b> - - - - -			N° di riferimento da usare nelle colonne sopra

# TriMED 1st version - Excel tables

A	B	C	D	E	F	G	
Technical term: Assess, to				Candidat traduisant: Évaluer			
Formal features				Caractéristiques formelles			
genre	verb			genre	verbe		
spelling	a s s e s s			ortographe	é v a l u e r		
tonic accent	/ˈɑːses/			accent	/evalqe/		
other	Far more frequent the -ing form "assessing" or the noun "assessment".			autre	Beaucoup plus fréquent le substantif "évaluation"		
Language Definition	Field	Register	Sources	Définition en Langue	Domain	Registre	Source
To evaluate a person or process	Medicine	Specialized	1	Déterminer, délimiter, fixer avec précision.	Générique	Standard	
/evaluate//something//someone/				/déterminer/ /fixer/ /précision/			
Specialized contexts	Field	Register	Sources	Proposition de traduction			
1. Pathological assessment of mediastinal lymph nodes in lung cancer.	Oncology	Specialized		Évaluation			
2. Surgical assessment and intraoperative management of mediastinal lymph nodes in non-small cell lung cancer.	Oncology	Specialized		Évaluation			
3. Consequently, an accurate pathologic assessment of mediastinal lymph nodes for metastasis is essential. Despite the significance of nodal assessment, practice patterns among surgeons vary widely.	Oncology	Specialized		Évaluation			
Ontological - encyclopedic illustrations				Illustration encyclopédique - ontologique			
Collocations - phraseology	Assessment of; nodal assessment; pathologic assessment; the assessment of; for assessment of; to require an assessment; assessing + NOUN;			Collocation - phraséologie	Évaluation de + SUB.; évaluable; évaluer quelquechose; évaluer après chimiothérapie; réévaluer à;		
References				Références			
<a href="https://medical-dictionary.thefreedictionary.com/assess">https://medical-dictionary.thefreedictionary.com/assess</a>				<a href="http://stella.atilf.fr/Dendien/scripts/tlfiv5/saveregass.exe?67;s=501373095;r=1;:">http://stella.atilf.fr/Dendien/scripts/tlfiv5/saveregass.exe?67;s=501373095;r=1;:</a>			
<a href="https://www.gov.uk/government/uploads/syst">https://www.gov.uk/government/uploads/syst</a>				<a href="http://pe.sfrnet.org/Data/ModuleConsultation">http://pe.sfrnet.org/Data/ModuleConsultation</a>			

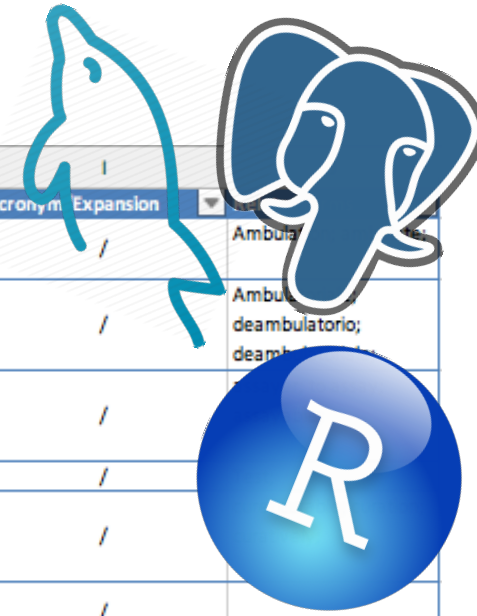


# TriMED 1st version - Excel tables

A				E			
Technical term: Assess, to				Candidat traduisant: Évaluer			
Formal features				Caractéristiques formelles			
genre	verb			genre	verbe		
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To evaluate a person or process	Field	Register	Sources	Déterminer, délimiter, fixer avec précision.	Domain	Registre	Source
/evaluate//something//someone/	Medicine	Specialized		/déterminer/ /fixer/ /précision/	Générique	Standard	
Specialized contexts				Proposition de traduction			
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References				Références			
<a href="https://medical-dictionary.thefreedictionary.com/assess">https://medical-dictionary.thefreedictionary.com/assess</a>				<a href="http://stella.atilf.fr/Dendien/scripts/tlfiv5/saveregass.exe?67;s=501373095;r=1;::">http://stella.atilf.fr/Dendien/scripts/tlfiv5/saveregass.exe?67;s=501373095;r=1;::</a>			
<a href="https://www.gov.uk/government/uploads/syst">https://www.gov.uk/government/uploads/syst</a>				<a href="http://pe.sfrnet.org/Data/ModuleConsultation">http://pe.sfrnet.org/Data/ModuleConsultation</a>			

# TriMED 2nd version - Relational tables

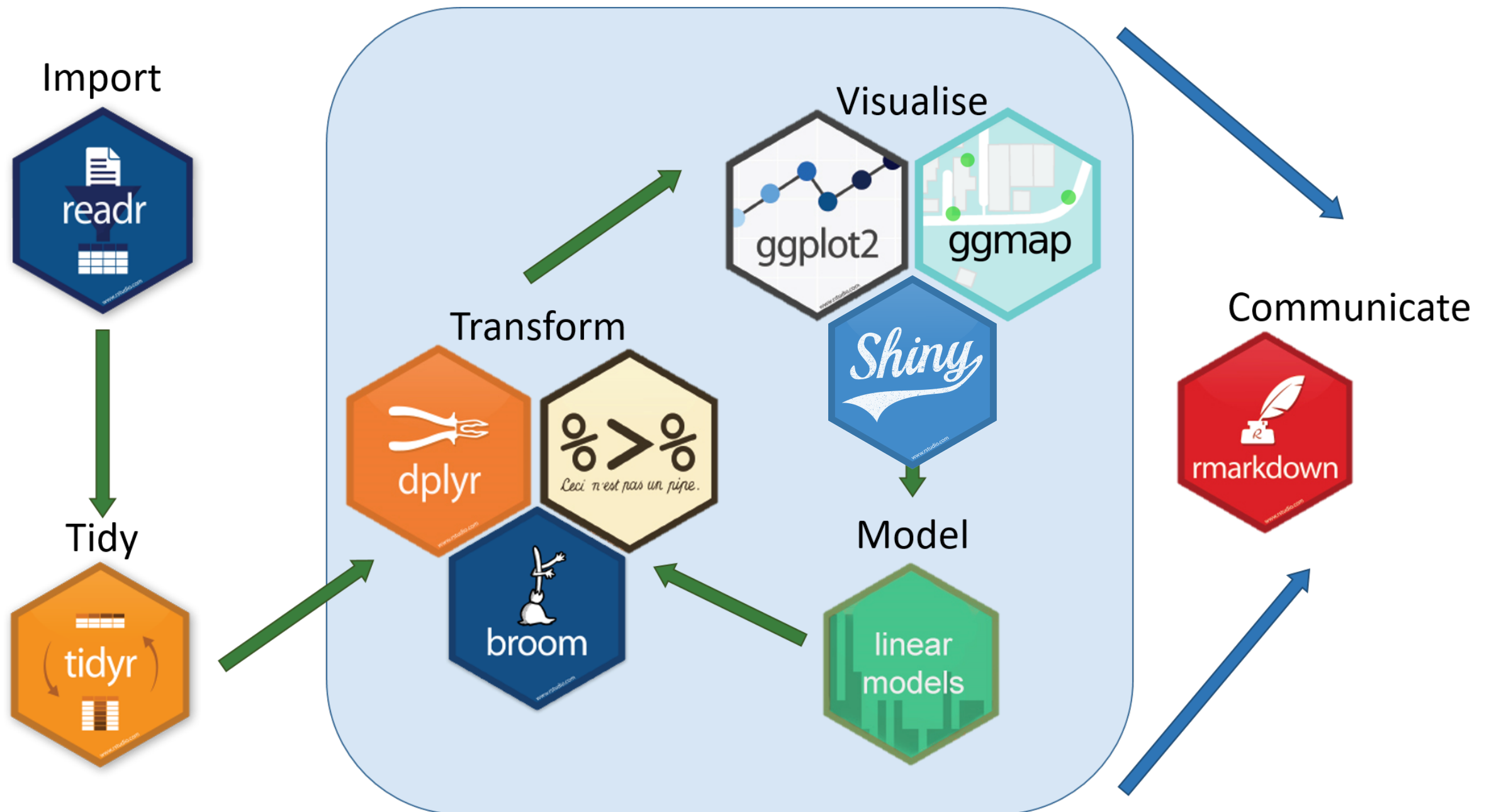
A	B	C	D	E	F	G	H	I	J
Term	ID	Language	Genre	Tonic accent	Spelling	etymology: derivation/Composition	Orthographic variant	Acronym	Expansion
Ambulatory	G1	English	Adjective	/ˈambjʊlət(ə)ri/	<i>ambulatory</i>	Mid 16th century (as a noun): from Latin ambulatorius, from ambulare 'to walk'.	/	/	Ambulatory
Ambulatorio	G1	Italiano	Agg., maschile	ambulatorio	<i>ambulatorio</i>	dal lat. ambulatorius «mobile, trasferibile», der. di ambulare «camminare».	/	/	Ambulatorio; deambulatorio; deambulatorio
Assay	G2	English	Noun	/ˈaseɪ/; /əˈseɪ/	<i>assay</i>	Middle English (in the general sense 'testing, or a test of, the merit of someone or something'): from Old French assai (noun), assaier (verb), variant of essai 'trial', essayer 'to try' (see essay).	essay;	/	/
Testare	G2	Italiano	Verbo	testàre	<i>testare</i>	er. di test, esemplato sull'ingl. (to) test e sul fr. Tester	/	/	/
Curative	G3	English	Noun or Adjective	/ˈkjʊərətɪv/	<i>curative</i>	Late Middle English (in the sense 'relating to cures'): from French curatif, -ive, from medieval Latin curativus, from Latin curare (see cure).	/	/	/
Curativo	G3	Italiano	Aggettivo	curativo	<i>curativo</i>	er. di curare.	/	/	/
Endemic	G4	English	Adjective	/enˈdemɪk/	<i>endemic</i>	Mid 17th century (as a noun): from French endémique or modern Latin endemicus, from Greek endēmios 'native' (based on dēmos 'people').	/	/	/
EUS	G6	English	/	/	<i>eus</i>	/	/	Endoscopic Ultrasound	echo-endoscopy
EUS	G6	Italiano	/	/	<i>eus</i>	/	/	Ecoendoscopia	Ecografia endoscopica
Healthcare	G7	English	Noun	/ˈhelθkeɪ/	<i>healthcare</i>	composed of: "health" + "care"	/	/	/
Assistenza sanitaria	G7	Italiano	Sostantivo	Assistèntsa sanitàà	<i>assistenza sanitaria</i>	assistenza: dal lat. tardo assistentia, der. di assistere «assistere»; sanitaria: derivato di "sanità", dal lat. sanitas -atis, der. di sanus «sano».	/	/	/
LF-LAM	G8	English	/	/	/	/	/	Lateral flow urine lipoarabinomannan assay	/
LAM Test	G8	Italiano	/	/	/	/	/	LAM acronimo di lipoarabinomannano	/
Lipoarabinomannan	G9	English	Noun	/ˈlɪpəˈrəbɪnəmənən/	<i>lipoarabinomannan</i>	derived from "lipo" + "arabinomannan".	/	LAM	ManLAM; PILAM; AraLAM (CheLAM)
Lipoarabinomannano	G9	Italiano	Sostantivo	lipoarabinomannàno	<i>lipoarabinomannano</i>	Composto da: lipo + arabinomannano; arabinomannano a sua volta composto da: "arabino" (abbreviazione del sostantivo "arabinosio") e "mannano" (abbreviazione di D-mannano).	/	LAM	Bacillo di Koch; Mycobacterium tuberculosis;
Resectability	G10	English	Noun	/riːˌsɛktəˈbɪlɪti/	<i>resectability</i>	early 20th century; earliest use found in Collected Papers Mayo clinical. Composed of "resect" + "ability".	/	/	/
Resecabilità	G10	Italiano	Sostantivo	résécabilità	<i>resacabilità</i>	sostantivo derivato dall'aggettivo <i>resecabile</i> , che viene da <i>resicare</i> , variante di <i>risicare</i> ; dal lat. <i>resicare</i> , comp. di <i>re-</i> e <i>secare</i> «tagliare».	Risicare;	/	Resecare; resecabile; resezione;





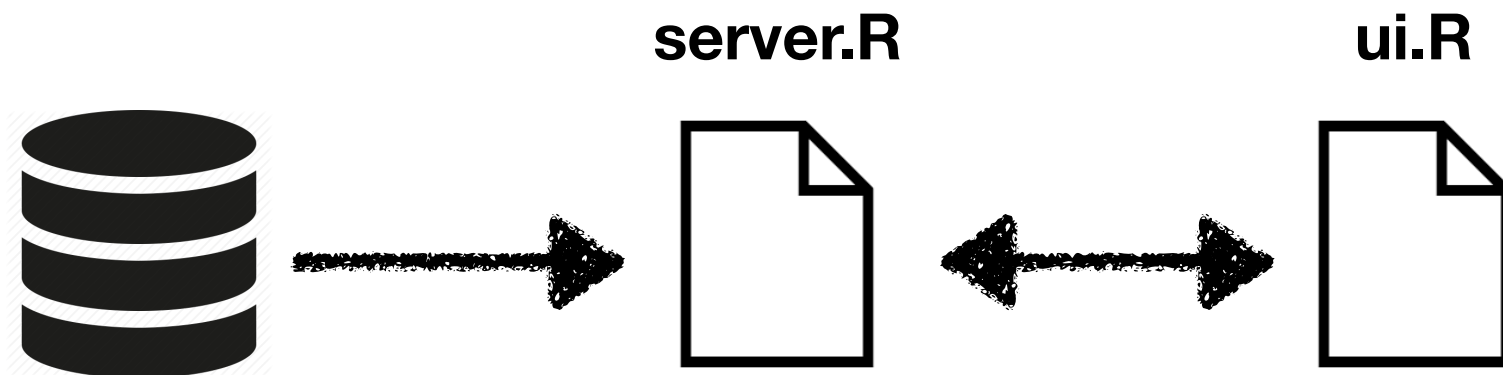
# Implementation Issues

# The R "Tidyverse"

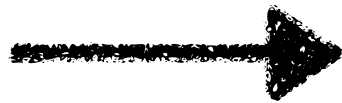


# Shiny Web Application

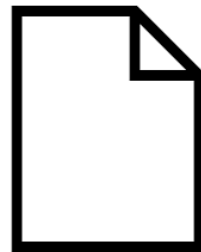
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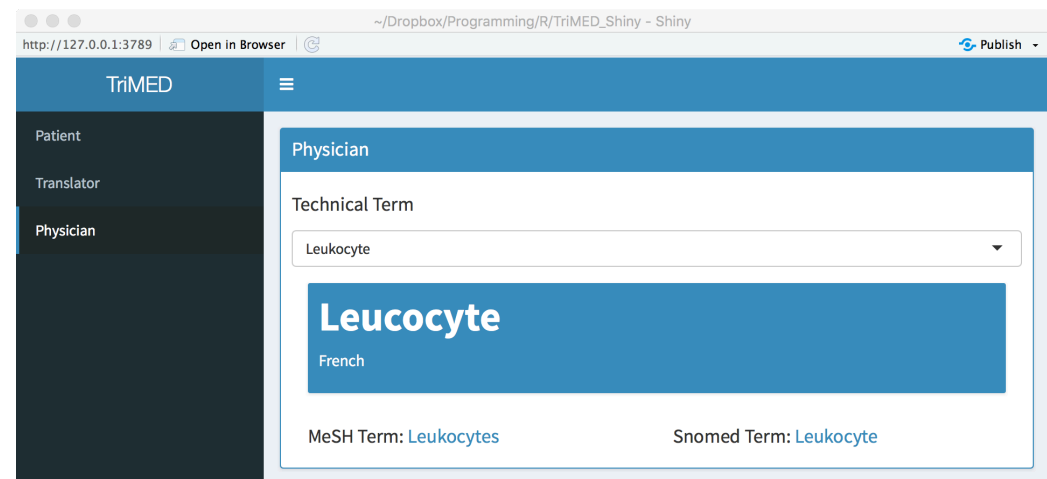
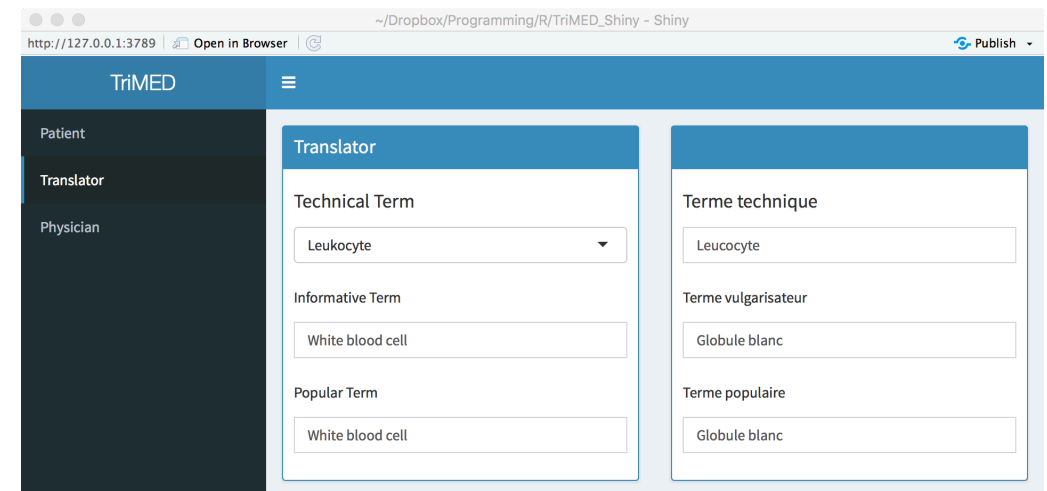
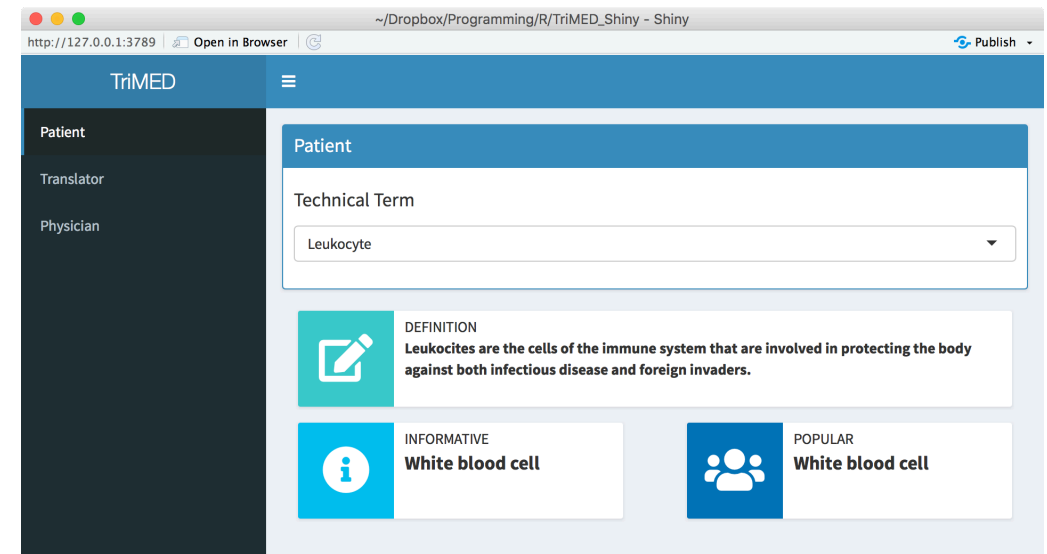
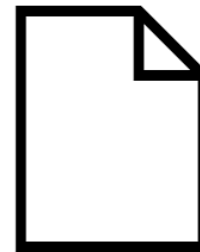
# Shiny Web Application



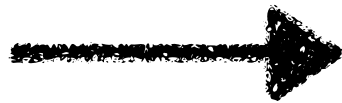
server.R



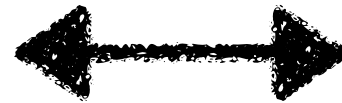
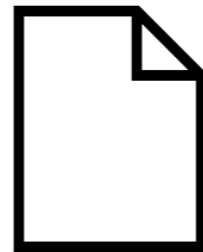
ui.R



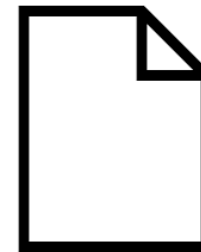
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server.R



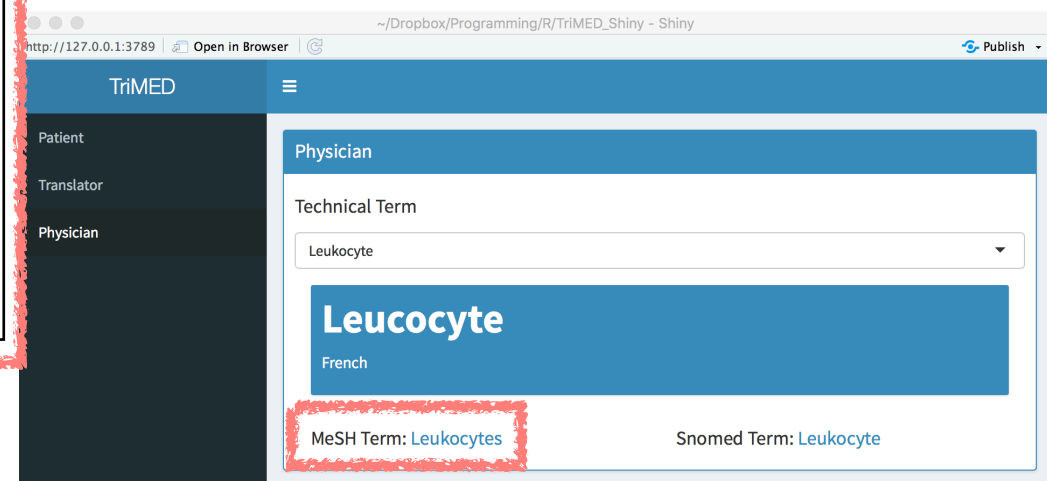
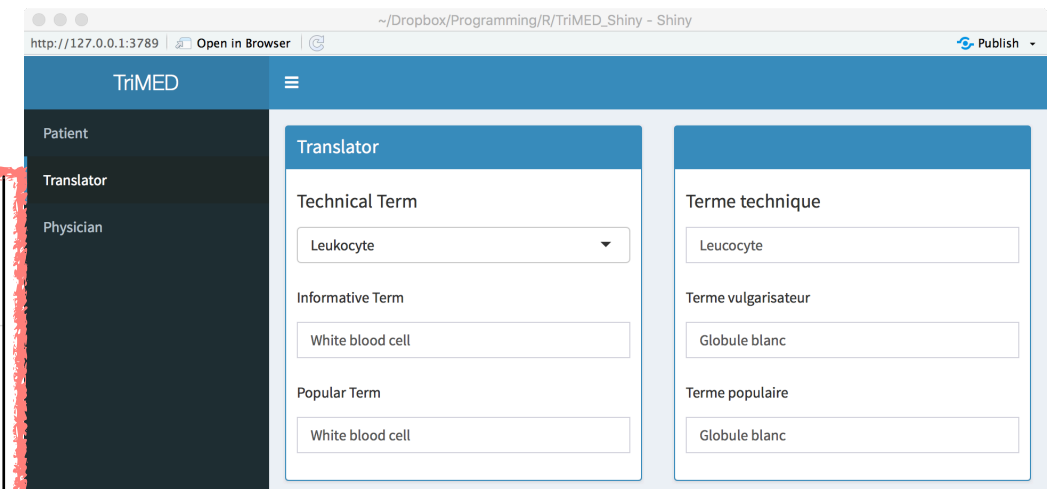
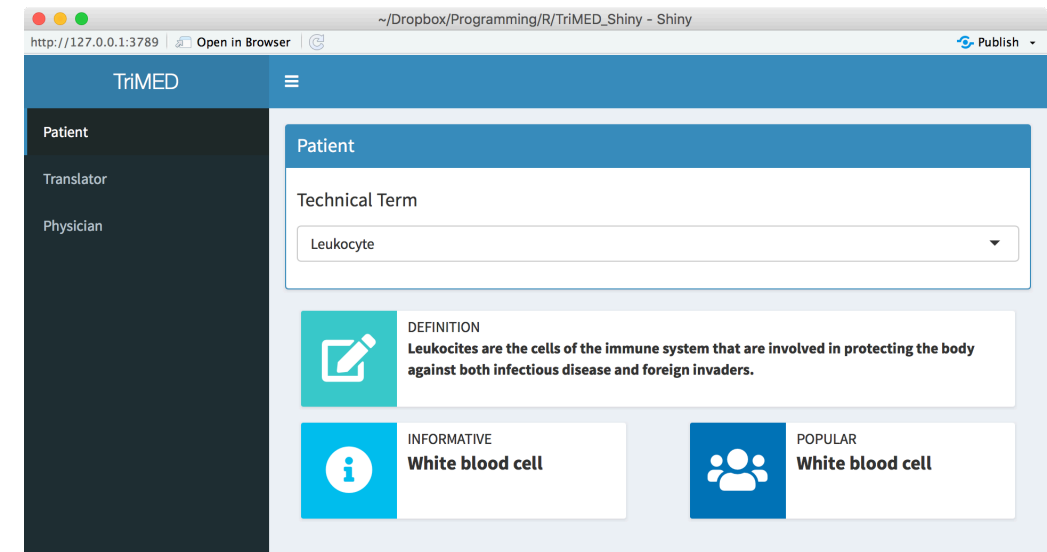
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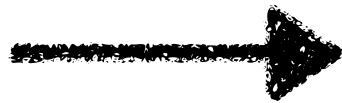
## Leukocytes MeSH Descriptor Data 2019

Details Qualifiers MeSH Tree Structures Concepts

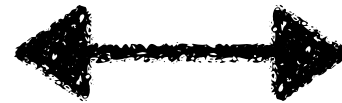
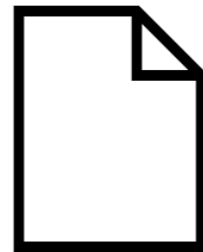
<b>MeSH Heading</b>	Leukocytes
<b>Tree Number(s)</b>	<a href="#">A11.118.637</a> <a href="#">A15.145.229.637</a> <a href="#">A15.382.490</a>
<b>Unique ID</b>	D007962
<b>Annotation</b>	decrease in no. of leukocytes: consider <a href="#">LEUKOPENIA</a> ; increase in number of leukocytes: consider <a href="#">LEUKOCYTOSIS</a> ; <a href="#">CELL MIGRATION ASSAYS</a> , <a href="#">LEUKOCYTE</a> is available
<b>Scope Note</b>	White blood cells. These include granular leukocytes ( <a href="#">BASOPHILS</a> ; <a href="#">EOSINOPHILS</a> ; and <a href="#">NEUTROPHILS</a> ) as well as non-granular leukocytes ( <a href="#">LYMPHOCYTES</a> and <a href="#">MONOCYTES</a> ).
<b>Entry Term(s)</b>	Blood Cells, White Blood Corpuscles, White White Blood Cells White Blood Corpuscles
<b>See Also</b>	<a href="#">Phagocytosis</a>
<b>Entry Combination</b>	<a href="#">transplantation:Leukocyte Transfusion</a>
<b>Date Established</b>	1966/01/01
<b>Date of Entry</b>	1999/01/01
<b>Revision Date</b>	2007/07/09



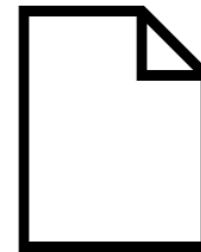
# Shiny Web Application



server.R



ui.R



Leukocytes MeSH Descriptor Data	
Details	Qualifiers MeSH Tree Structures Concepts
MeSH Heading	Leukocytes
Tree Number(s)	A11.118.637 A15.145.229.637 A15.382.490
Unique ID	D007962
Annotation	decrease in no. of leukocytes: consider L LEUKOCYTE is available
Scope Note	White blood cells. These include granular (LYMPHOCYTES and MONOCYTES).
Entry Term(s)	Blood Cells, White Blood Corpuscles, White White Blood Cells White Blood Corpuscles
See Also	Phagocytosis
Entry Combination	transplantation:Leukocyte Transfusion
Date Established	1966/01/01
Date of Entry	1999/01/01
Revision Date	2007/07/09

Concept Details

Concept Details

Summary Details Diagram Expression Refsets Members References

Stated Inferred

Parents

- Blood cell (cell)
- Structure of immune system (body structure)

Leukocyte (cell) ☆

SCTID: 52501007

52501007 | Leukocyte (cell) |

en Leukocyte

en White blood cell

en WBC - White blood cell

en White blood cells

en Leukocyte

en Leukocyte (cell)

No attributes

Children (4)

- Granulocyte (cell)
- Immune effector cell (cell)
- Lupus erythematosus cell (cell)
- Peripheral blood mononuclear cell (cell)

TriMED

Patient

Translator

Physician

Patient

Technical Term

Leukocyte

DEFINITION

Leukocytes are the cells of the immune system that are involved in protecting the body against both infectious disease and foreign invaders.

INFORMATIVE

White blood cell

POPULAR

White blood cell

TriMED

Patient

Translator

Physician

Translator

Technical Term

Leukocyte

Informative Term

White blood cell

Popular Term

White blood cell

Terme technique

Leucocyte

Terme vulgarisateur

Globule blanc

Terme populaire

Globule blanc

TriMED

Patient

Translator

Physician

Physician

Technical Term

Leukocyte

Leucocyte

French

MeSH Term: Leukocytes

Snomed Term: Leukocyte

# Standardization

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- Terminology Base eXchange ISO 30042:2008
- Interchange
  - integration of terminological data from multiple sources
- Dissemination
  - querying multiple terminological databases through a single user interface
- Analysis and representation
  - comparing the contents of various terminological databases

# Conclusions

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- Terminological Resource for eHealth
- Records will be available under CC License
- Source code available on GitHub
- FAIR @ UNIPD Research Data Digital Library



# Thank you!

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